

## Opportunities and Challenges for Decarbonizing Steel Production by Creating Markets for 'Green Steel' Products

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**Abstract :** The creation of a market for lower-carbon steel products, here called 'green steel', has been identified as an important means to support the introduction of breakthrough emission reduction technologies into the steel sector. However, the definition of what 'green' entails in the context of steel production, the implications on the competitiveness of green steel products in local and international markets, and the necessary market mechanisms to support their successful market penetration remain poorly explored. This paper addresses this gap by holding semi-structured interviews with international sustainability experts and commercial managers from leading steel trade associations, research institutes and steelmakers. Our findings show that there is an urgent need to establish a set of standards to define what 'greenness' means in the steelmaking context; standards that avoid market disruptions, unintended consequences, and opportunities for greenwashing. We also highlight that the introduction of green steel products will have implications on product competitiveness on three different levels: 1) between primary and secondary steelmaking routes, 2) with traditional, lesser green steel, and 3) with other substitutable materials (e.g. cement and plastics). This paper emphasises the need for steelmakers to adopt a transitional approach in deploying different low-carbon technologies, based on their stage of technological maturity, applicability in certain country contexts, capacity to reduce emissions over time, and the ability of the investment community to support their deployment. We further identify market mechanisms to support green steel production, including carbon border adjustments and public procurement, highlighting a need for implementing a combination of complementary policies to ensure the products' roll-out. The study further shows that the auto industry is a likely candidate for green steel consumption, where a market would be supported by price premiums paid by willing consumers, such as those of high-end luxury vehicles.

**Keywords :** green steel, decarbonisation, business model innovation, market analysis

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